

Claims

1. Macromolecular hydrophilic photocrosslinkers having a general formula

5 (A)_n(B)_m(C)_p

capable of producing, upon exposure to light, crosslinked networks, wherein

10 (i) A, B and C are units of substituted ethylene groups in the macromolecular structure;
(ii) A, B and C are randomly distributed and the unit C carries a photoactive group;
(iii) n = 0-98 mole %, m = 0-98 mole %, n+m = 50-98 mole % and p = 0.5-50 mole %;

15 and when said photoactive groups are exposed to light of determined wavelengths above 305 nm, radicals are generated and retained on the macromolecular photocrosslinkers and reacting so as to accomplish a crosslinked network structure.

20 2. Photocrosslinkers according to claim 1 characterized in that said photoactive group comprises a phosphine oxide.

25 3. Photocrosslinkers according to claim 2 characterized in that the photoactive group is an acyl- or aroyl phosphine oxide.

4. Photocrosslinkers according to claim 3 characterized in that the photoactive group is linked to the ethylene groups of units C by a linking group comprising a phenylene group, said phenylene group being optionally substituted.

30 5. Photocrosslinkers according to claim 3 characterized in that the photoactive group is linked to the ethylene groups of units C by a linking group comprising a group having the structure

-O-C(O)-NH-.

6. Photocrosslinkers according to claim 5, wherein the linking group has the structure of -O-C(O)-NH-Ph-, wherein Ph denotes an optionally substituted phenylene group.

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7. Photocrosslinkers according to claim 1, wherein the ethylene units A, B, C of the macromolecular structure comprises substituents in accordance with:

A= -CH₂-C(R¹R²)-, B= -CH₂-C(R¹R³)-, C= -CH₂-C(R¹R⁴)-, wherein

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R¹ is hydrogen or methyl;

R² is -CON(Me)₂, -CO₂CH₂CH₂OH, -OCOCH₃, -OCOCH₂CH₂Ph, -OH or a lactam group;

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R³ is -CON(Me)₂, -CO₂CH₂CH₂OH, -OCOCH₃, -OCOCH₂CH₂Ph, -OH or a lactam group when B is -CH₂-C(R¹R³)- with the proviso that R² and R³ are not the same unless R² and R³ is -OH ; and

R⁴ is -R⁵C(O)P(O) R⁶R⁷ or -R⁵P(O)R⁶OC(O)R⁷, wherein R⁵, R⁶ and R⁷ are selected

20 among same or different aryl groups comprising phenyl, methylphenyl, dimethylphenyl, trimethylphenyl, methoxyphenyl, dimethoxyphenyl, trimethoxyphenyl, methylophenyl, dimethylophenyl, trimethylophenyl or styryl radicals, or

R⁴ is -R⁸C(O)P(O) R⁹R¹⁰, wherein R⁹ and R¹⁰ are the same as R⁵, R⁶ and R⁷ above, but R⁸ is a group -O-C(O)-NH- R¹¹, wherein R¹¹ is the same as R⁹ and R¹⁰.

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8. Photocrosslinkers according to claim 7, wherein R² and R³ are selected so as to form a water-soluble molecule.

9. Photocrosslinkers according to claim 7, wherein said lactam units together with units A
30 or B constitute N-vinylpyrrolidone units.

10. Photocrosslinkers according to claim 7, wherein at least one of R² and R³ is hydroxyl.

11. Photocrosslinkers according to claim 7, wherein A is N-vinylpyrrolidone, B is vinyl
5 alcohol.

12. Photocrosslinkers according to claim 7, wherein R⁴ is -O-C(O)-NH-R⁸-C(O)P(O)
R⁹R¹⁰.

10 13. Photocrosslinkers according to claim 1 or 7 provided with functional groups for
crosslinking.

14. Photocrosslinkers according to claim 13 provided with functional groups selected
among vinylic, acrylic and methacrylic groups.

15 15. A method of preparing a photocrosslinker from a hydrophilic macromolecule
(A)_n(B)_m(C)_p
(i) A, B and C are units of substituted ethylene groups in the macromolecular
structure;
20 (ii) A, B and C are randomly distributed and at least the unit C carries a hydroxyl
group;
(iii) n = 0-98 mole %, m = 0-98 mole %, n+m = 50-98 mole % and p = 0.5-50 mole %;
by reacting said macromolecule with an isocyanate substituted photoactive agent having
the structure -C(O)=N-R⁸-C(O)P(O) R⁹R¹⁰, wherein R⁸, R⁹ and R¹⁰ are selected among
25 same or different aryl groups comprising phenyl, methylphenyl, dimethylphenyl,
trimethylphenyl, methoxyphenyl, dimethoxyphenyl, trimethoxyphenyl, methylolphenyl,
dimethylolphenyl, trimethylolphenyl or styryl radicals.

30 16. A method of forming a macromolecular crosslinked network from an aqueous
composition comprising a photocrosslinker according to any of claims 1 to 14 by

irradiating with light exceeding a wavelength of about 305 nm for a time sufficient to form a solid article.

17. A method according to claim 16, wherein said composition further comprises at least one copolymerizable vinylic, acrylic or methacrylic monomer.

18. A method according to claim 16, wherein said composition further comprises a hydrophilic polymer provided with functional vinylic, acrylic or methacrylic groups.

10 19. A method according to claim 18, wherein said hydrophilic polymer forms discreet crosslinkable units in form of water-soluble particles.

15 20. A method according to any of claims 16 to 19, wherein an ophthalmic lens is produced from said composition.

21. A method according to any of claim 20, comprising the steps of injecting said composition into the capsular bag of the eye and crosslinking it into a final lens product by irradiation of a wavelength exceeding 305 nm.

20 22. An ophthalmically acceptable composition comprising the photocrosslinkers according to any of claims 1 to 15 having a refractive index of at least 1.39 and a suitable viscosity to be injected through a standard cannula of 15 Gauge, or finer.

25 23. The use of photocrosslinkers according to any of claims 1 to 15 in an ophthalmically acceptable composition for injection into the capsular bag of the eye.